

without caltropes. Length 8.5 to 13 mm. Duration of the stage 6 days.

Stage VIII.—Elongate elliptical, dorsum gently arched, moderately broad, sides oblique, subventer retracted. Patches of black spines present above the long subdorsal horn of joint 13 and the short lateral one of joint 12; caltrope patches at the bases of the lateral horns on joints 6 to 11. Joint 3 stained with purple, its horns long, tapered and vinous purple. Subdorsal and lateral ridges vermilion lined, the rounded horns short and equal. Dorsum pale pink, the three lines nearly black, the middle one straight, the side lines waved; glandular spots (1) dark with raised granular edges; a yellowish border to the subdorsal ridge. Sides less pinkish, the central line broken and wavy, rather purplish than black, the upper and lower lines black, the upper well waved, the lower less so. Subventer carneous with two blackish lines, the subventral edge reddish. The long subdorsal horn of joint 13 is purplish as also the laterals of 4 and 6 slightly. Skin rather densely clear granular. Spines on the horns white with black tips. Length 13 to 17 mm. Duration of the stage 3 days (in hot weather).

THE EGGS AND NYMPHAL STAGES OF THE DUSKY LEAF BUG CALOCORIS RAPIDUS SAY.

BY R. L. WEBSTER AND DAYTON STONER.

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In the course of some work on potato insects, being carried on at the Iowa Experiment Station, a few notes were accumulated on the dusky leaf bug, *Calocoris rapidus* Say, which occurred rather abundantly on potato plants at Ames in 1913. The egg, which had not been previously observed, was found, and descriptions of the five nymphal stages were prepared. These notes are from the files of the entomological section of the Iowa Agricultural Experiment Station at Ames.

INJURY TO POTATOES.

During July, 1913, these insects were fairly common in potato fields in company with the tarnished plant bug, *Lygus pratensis* Linné, but no special attention had been given either insect. July 18, when the writers were collecting in a small potato patch, it was noticed that certain plants were wilted down at the growing tips. Frequently one or more nymphs or adults of *Calocoris rapidus* were associated with this injury, found with the beaks inserted in the partially withered stems.

In order to verify the assumption that the wilting was caused by this insect 25 adults were placed on a healthy potato plant in the insectary July 19. Two days later the same characteristic injury was noted on these plants; the wilting down of the more tender leaves where the insects preferred to feed. Other similar insectary experiments showed without doubt the nature of the injury to potato.

Although the insect seems never to have been recorded as feeding on potatoes, it was abundant enough to attract attention in this instance. However, it may hardly be considered as more than of secondary importance.

LIFE HISTORY NOTES.

Since observations on the insect did not begin until late in July, the following notes concern only the late summer and early fall. Unless otherwise indicated observations were made on potato plants. The adults were found most abundant during July. On August 6 adults were still common, but many nymphs were also present, most of which appeared to be past the second nymphal stage.

In a note by Mr. Stoner under date of August 8 adults are recorded as being less common. Dissection of several females collected on this date, however, revealed the fact that eggs were still present in the oviduct, in advanced stages of development, probably still being deposited. Mr. Stoner found 8, 15 and 17 eggs in three females dissected.

August 15 nymphs were abundant, much more so than the adults. Stage V was most common. In the insectary stage I nymphs were then present and eggs were still hatching. On August 20 conditions were practically the same.

In September adults became more common, although the older

nymphs were present in some numbers. October 1 adults were common on some cabbage plants and one nymph was found on that date.

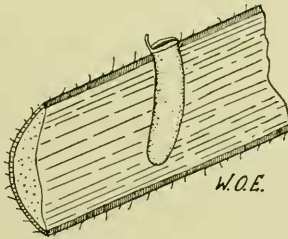
From these notes it is evident that a new generation appears in late July and early August, maturing during September. The winter is evidently spent in the adult stage.

There are probably two generations in this latitude, as Forbes has suggested. These observations, then, deal with the second generation, and the adults of the first late in July.

THE EGG.

Adults confined in insectary cages readily deposited eggs in potato stalks. Usually these were placed in the tissue at the junction of the smaller stems with the main stalk and in the axils of the leaves. They were also deposited, to a considerable extent, on the main stalk for its entire length.

Usually eggs were placed singly; sometimes several were found in close proximity, or even adjacent. As a rule the eggs were placed at right angles to the long axis of the stalk; sometimes at an acute angle to the stalk, or even almost parallel, though imbedded in the tissue.



From the exterior it was possible to detect the presence of the egg by the ovate cap, which is provided with a short spine, all that is visible.

Following is given a description of the egg.

Egg.—Cylindrical, slightly curved; exposed end with a narrow truncate cap which projects for its entire width outside the epidermis of the plant; opposite end broadly rounded; surface very finely punctate. General color of fresh eggs yellowish green. Length 1.17 mm., width .31 mm. (average of 9 specimens).

Cap.—Generally ovate in outline, from exterior of plant; sometimes with sides slightly concave. Margin of cap finely serrate on edge; ridged on inner side, the ridges corresponding to the serrations. A series of hairs, arranged quite regularly, joins the lower, outer edge of the cap with the pellicle and apparently holds the cap in place. Color within the margin, yellowish green. (This may vary with the state of development of the egg).

The cap bears a short, stout spine which is attached on the concave side of the egg. The spine is rigid, but flexible at the base, where it joins the margin. Spine enlarged slightly and rather abruptly at tip and projects for its entire length outside the epidermis of the plant. Color pale reddish; length .16 mm.

According to insectary records, from 11 to 13 days were required for eggs to hatch; this in the latter half of July and the first half of August.

THE NYMPHAL STAGES.

Dr. Forbes¹ studied this species as a strawberry insect and published descriptions of certain of the nymphal stages. Forbes, however, was under the impression that there were but four nymphal stages, whereas the actual number is five. The stages described by him as II, III and IV are, in reality, III, IV and V. Descriptions of the five stages follow.

Stage I.—Head and prothorax brownish; meso- and metathorax yellowish, sometimes greenish; abdomen pale clay yellow; body sparsely setaceous, setæ black; length 1.4 mm.

Head including eyes slightly wider than prothorax; eyes deep rose; antennæ pale cadmium yellow, except last segment, which is deep red, white tipped and with a somewhat broader white band at base; sparsely clothed with fine white hairs; beak long, the tip extending well on to the abdomen, color pale cadmium yellow, tip dusky. Prothorax narrower than succeeding segments, about one fourth longer than mesothorax, distinctly margined; mesothorax nearly twice the length of metathorax; metathorax short.

Abdomen ovate, broadest before middle, pale clay yellow except on margins and apex of venter, where it is pale cadmium yellow. Femora pale cadmium yellow, hind pair slightly darker; tibiæ pale

¹ Forbes, S. A., 13th Rep. State Ent. Ill., p. 135. 1884.

clay yellow, dusky at tips; tarsi pale but with the apical fourth dusky; whole leg sparsely clothed with fine white hairs.

Stage II.—Form and color as in stage I, but with a large reddish patch covering most of the abdomen. Length 2.06 mm.

Head and thorax similar to stage I. Prothorax short. Mesothorax slightly longer; metathorax very short; both margined and greenish in color.

Most of the abdomen is reddish, sometimes greenish on first and second segments and also towards caudal extremity; tip red. Abdomen beneath pale green, reddish at sides. First and second abdominal segments shorter than succeeding segments. Femora and hind tibiæ reddish; front and middle tibiæ pale clay yellow; all the tarsi pale, black tipped.

Stage III.—Form and color in general as in preceding stage. Length 2.6 mm.

Head dragon's blood; eyes purple lake. Antennæ: first segment pale cadmium yellow; second segment the same, darker distally; third, pale proximally, shading into deep red distally; fourth segment as in preceding stages. Prothorax same color as head, except the caudal margin, which is greenish. Mesothorax and metathorax pale green; margined; both very slightly produced caudo-laterad.

Abdomen as in preceding stages. Femora reddish, the hind pair with a narrow pale band near apex; tibiæ pale, except hind pair, which is reddish, black tipped; tarsi pale, black tipped.

Stage IV.—Form and color similar to preceding stage, but with the wing pads well developed. Length 3.6 mm.

Head similar to preceding stage. Antennæ: first segment chrome orange; second, pale cadmium yellow, shading into reddish distally; third and fourth segments as in stage III. Mesothorax and metathorax produced into wingpads which reach to or upon the second abdominal segment; wingpads slightly dusky at tips.

Abdomen similar to stage III; first and second segments subequal in length above, laterad and ventrad the first is much compressed, the second much swollen. Color of legs the same as in stage III; femora clothed with fine black hairs; tibiæ with many stiff black hairs.

Stage V.—Form elongate oval; general color as in preceding stage, but wingpads conspicuously tipped with dusky or sometimes black. Length 4.6 mm. (average of 10 specimens)

Head burnt sienna, varying to dragon's blood. Antennæ: first segment burnt sienna; second, proximal half pale, becoming deep red distally; third and fourth segments as before. Beak of same color as head, black tipped, reaching to hind coxæ. Prothorax with a transverse band of burnt sienna cephalad; remainder pale green; much broader caudad. Mesothorax and metathorax pale green; wingpads dusky or black at tips and along outer margins, becoming lighter toward base.

Abdomen greenish, with transverse red-brown patch, of which only the caudal portion reaches the sides; tip reddish. Femora reddish with pale mottling. Front and middle tibiæ pale, black tipped; hind tibiæ deep red. Tarsi pale, black tipped.

A few records were obtained of the time spent in the several stages, but none of these are complete. The insects died in the cages, in spite of the care given them. From these few notes it was found that 2 to 3 days were spent in stage I; 2 to 4 days in stage II; 2 to 3 days in stage III; 5 days (one record) in stage IV. No records for stage V were obtained. December 16, 1913.

NEW MEMBRACIDÆ FROM THE EAST INDIES.¹

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The following new species are representatives of the subfamily Centrotinæ which appears to be the dominant group of Membracidæ in the oriental regions.

For the species from the Philippine Islands I am indebted to Professor C. F. Baker of the College of Agriculture, Los Banos, P. I.

1. *Gargara nigrocarinata* new species.

Black; finely and densely punctate; thickly covered with short yellowish pubescence. Head long; clypeus extending for half its length beyond the inferior margin of the cheeks; eyes reddish-brown; ocelli black, farther from each other than from the eyes and located above a line passing through middle of eyes. Prothorax obtusely rounded in front; lateral angles prominent, pro-

¹ Contribution from the Entomological Laboratory of Cornell University.